

A Self Adaptive Interface Design System Based on Personality Aesthetics for E-Learning

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Abstract— In the current era of technology, people who are busy with the hectic life and yet want to continue their learning phase, prefer E-learning. For this, the interfaces of the software and web based systems are quite imperative. The modern man of this technology era is more concerned with the looks and user friendly interface. Considering the learning advantages of technologies and web, we find several tutorials and teaching platforms, where the UI design, look, and feel affects the cognition as well as the way of learning and User Experience UX. Several studies show that metrics of good aesthetics, interactive designs, and good typography lead towards a good design. So, for proper reflection of society in research, it is needed to consider everybody's personalized interests as well. Having an unpleasant interface may lose users. This counts as a reason to analyse more ways to enhance the learning process. This paper would focus on analysing the interface design of E-learning systems as per the user's satisfaction. This is done by considering user's own aesthetic sense for their better performance and enhanced learning rate over tutorial based systems. Moreover, the effect of Self Adaption and User Modelling on E-learning and tutorial systems is also discussed.

Keywords— E-Learning, Human Computer Interaction, UI (User Interface), UX (User Experience), User Modeling and Aesthetics Design

I. INTRODUCTION

The E-learning portals and online tutorials of different courses have progressively caught fire in becoming trend and need of this era. In addition to that online tutorial systems are also in wide use, several platforms are provided for online courses, E-learning, or tutorial based systems these days as those are a big need of today's busy life. People with busy life prefer e-learning. It saves their time and play part in their learning phase. Today there are many institutes in every country which offer online courses or virtual campuses that

depend merely on delivering the lectures over internet. There are many platforms which provide online training and certifications and people use them widely to enhance their knowledge while staying at home.

As the advanced technologies come up in every field of life, we see more desktop applications and web-based systems. The first thing with which the user must interact is its interface. The interface is, thus getting interest for the designers as well as for the users. If this tends to be attractive, people would interact more. The studies of Interaction design say that the people these days have higher expectations with the interfaces. Furthermore, if we are concerned with any educational software or web-based tutorial system, the aesthetics of reading imply that the design's impact affect the way of people's learning. The more one finds a design good for him the more engaging behavior he shows [1]. The researchers have come up with the theory that the people who have good mood towards an interface perform better cognitive tasks and learning [1]. Barbara Chaparro at Wichita State University found out the performance difference between documents with good page layout and poor page; users responded with questionnaires that they significantly idealized the good page layout documents [1]. The subject is not only the design improvement but also its improvement based upon the fact that everybody gets his preferred type of visual and aesthetic design. Usually the consideration that *what is normal and average residents are willing to have/see*; puts a stop to constructive implementation of aesthetics design and makes the rest of people suffer from having unattractive design. Technologies provide several learning platforms through tutorials and other teaching platforms. In all these the design relevance to the user's choice affect the cognition and learning process [3]. As the personalization of certain things has more pleasing emotional impact compared with the sameness of objects, so personalization and customization are a big direction towards a better design [2]. We either need to design a universal interface or create a way to implement the choice of everyone on the interfaces.

As we know that our environment is very diverse and everyone has his/her own individual qualities and characteristics. Learners are not the same (physically, mentally, and emotionally) and don't have the same choices, likings, and aesthetics [4], [6], [8]. Moreover, user's preferences are various. So, adaptation turns out to be very significant, especially in the field of education [2]. One distinguishing feature of an adaptive system is a *User Model*

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[8]. User model is a distinct demonstration of information about an individual, needed for an adaptive system to offer the effect of adaptation as result, i.e., to act in a different way for different users. For example, when an individual user looks for a tutorial or reading/learning material, the system can adaptively select and prioritize the interface that is most relevant to that user's pre-built profile [8], [9].

The traditional Learning management system though serve a great purpose but are mostly implemented with the thought that one design is good for all [9]. This means that all or most of these designs are developed and deployed on designs based on generalized requirements. While it's not always the case that those generalized requirements and designs are likeable for everyone. The learners' learning styles and other preferences are not considered in the requirements always [9]. One more strategy for personalization of e-learning can also be found by sticking to the prediction of personalization based on particularity of different courses. This scheme also depends on certain metrics and their incorporation with the student/learners own personal characteristics.

In this paper, we have proposed a system which analyzes the effect of applying one's personal aesthetics and characteristics as the parameters of designing interfaces of the tutorial based systems called as Self Adaptive Interface Design system. Such solution would work in two tiers, first one would be the *Memory layer* to store the individuals profile and preferences as user or learner's model and second one would be the *Dynamic layer* that would function to dynamically come to a decision that which of the interface from the pre-built multiple interfaces, is relevant to the user's pre-built profile. It would then show the reading material displayed in that design. The reading /learning material displayed using such learner model (a model of user/ learner preferences and history) would be more understandable and easy as the psychological factors would work to adapt the system's design to work as it is personality targeted UI design [8]. In this way, it would be possible to increase the learning rate of individuals by giving them all as per their choice so that nothing in the interface would annoy or disturb their learning process. The rest of this paper will highlight the related work in this domain.

II. ROLE OF AESTHETIC AND CULTURE IN SELF ADAPTIVE INTERFACE DESIGN

With the advent of technology and software Industry, there are several shortcomings of these too, that lead the researchers towards betterment in the field. Dr. Kevin Larson, Dr. Rosalind W. Picard, Behnam Fagih, Dr. Mohammad Reza Azadehfar, and Prof. S. D. Katebi in their studies come up with the idea that the main drawback of many software systems is their complexity, (usually caused by poor usability), static, poor and general design as well as design from different cultural and personality contexts [1], [2], [3]. Oded Nov, Ofer Arazy, Claudia López, Peter Brusilovsky also support the same viewpoint [8]. Dr. Kevin Larson, Dr. Rosalind W. Picard, through study and survey prove that a person's rapid, unconscious cognition links to his learning;

you can say if the design attracts him he may make positive conclusions from the tutorials and would perform better cognitive tasks. As the metrics of good design, good layout, and good typography lead towards better response in learning and cognition because they tend to generate a pleasant mood and learning environment to the users [[1]].

Donald A. Norman in his book on emotional design gave plenty of interactive and practical example to demonstrate how Emotional Design or attractive appearance of anything not only delights the designers but also the managers and users by soothing their psychological states. He made impact of presentation of something quite clear by explaining how the fancy treatment of ordinary articles makes them extraordinary [2].

Behnam Fagih, Dr. Mohammad Reza Azadehfar, and Prof. S. D. Katebi declared in their research in 2013 that Design of User Interface should not be considered as a factor in learning process rather than only being thought of as an attractive or unattractive tool [3]. If animation distracts oneself they must be omitted and if they are helpful for learning (like in case of most of the children), they must be used in the way they are needed. The researchers have highlighted that whatever is used in the UI design should have a certain compatibility and relevance to the individual's psychological issues as well as educational issues. These three also count UI (user interface) design as the biggest challenge in any software, which must have a certain balanced communication between user and system in a sound, pleasant, as well as in a suitable way [3].

The learning process is more likely to become less difficult by using an eye-catching design. Because such a design when compared to an irritating one, shows up to make people delighted. Herman Dwi Surjono evaluates the learning of adaptive systems through different learning models, summing up his discussion that the adaptive system that recognizes the learning style of a student, gives him different presentations of learning material hence elevating the learning ability [4].

Moreover, A study conducted by Jan L. Plass, Steffi Heidig, Elizabeth O. Hayward, Bruce D. Homer, and Enjoon Um, presents the role of mood and emotions of any individual in recalling, learning, and memorizing which concludes that a good or positive emotion boost up the process of memorizing and learning. Their survey on memory also implies that positivity in emotional state of any user elevates his/her recalling ability from long term memory, while good and positive emotions can be generated by pleasant Interface design. This Survey also shows that some certain conjunction of shapes with warm or cool colors (like circle shapes with warm shades) make different effects on users and their mood/emotions some combinations of shape and colors make things stay neutral while some raise positive emotions [5]. Hence the study about emotions can guide one about how he/she can improve icons or components of their UI Design to enhance the user involvement and learning making him engaged with the content for longer.

The current researcher community either young or old, all spends hours over the internet and for that sake A. Dickson, J. Arnott and S. prior provide a detailed discussion over the survey practices that are usually carried out and reformulated

them by taking the older age people under consideration. There are certain designs that may attract one class of people but others might find them irritating taking the comparison of youngsters and older people. Both classes of people have a different state of mind and interests. The researchers which usually are from an older age group should not find any platform to be annoying so they should also be made a part of the surveys before any platform is designed [6].

After the aesthetics' value, we analyzed the culture as our context for analyzing adaptive systems where the researches Katharina Reinecke and Abraham Bernstein has shown the fact that the cultural gap between the software designs is the biggest obstacle for efficient use of software. The software typically follow western or any specific culture, and the users are handling it within their cultural frame which makes culture also a factor to move towards adaption of interfaces as per the user models [7].

The left-over possibility of having a distasteful or exhaustive interface remained the same as the studies so far took any single factor and made the other one slipped off. This gave us a reason to find more ways to either create a way to implement the choice of each individual or to find a way to design universal interfaces. By carrying out different studies focusing on audience size and social anchoring cues, in a study. Some researchers also came up with the idea that supporting an e-learning system that considers, the dissimilarities between users/learners can lift their learn ability, noticeably [7].

A survey conducted for exploring personality-targeted design by Oded Nov, Ofer Arazy, Claudia López, Peter Brusilovsky it has been found that personality targeted design affects the individuals and their participation. Which ultimately reduces a user's cognitive load, hence leads to an increased online participation rate. However, it was seen that it had a different kind of effect on people with different levels of emotional stability. It demonstrates that personality targeted design is more helpful to users as compared to design applied to entire population [8].

Another team formed of three researchers, Mr. Mohammad Al-Omari, Dr. Jenny Carter, and Prof. Francisco Chiclana has studied and worked over the frameworks on which adaptive nature can be implemented and supported for e-learning an environment which has now become a need for the people who want to study at distant places from their institutions and for those who are willing to study at their own using the web. Their framework is implemented over technology based on Agents and Event Condition Action model (ECA) for implementing the adaption in some specific learning system [9].

The studies and researches well highlight the need for an e-learning environment that holds some characteristics to adapt the system design as per the user's personal Aesthetic sense based upon some preferences and questions he/she specifies and answers to the system. Such a system would be a great step which would not only target any specific metric but some very common metrics to improve learning, collectively, including the personal preferences, age factor, culture, colors and shapes preferences, and other psychological factors as

well. Once these factors are adapted in a system, adding a more sophisticated functionality of course based adaption can help learners even more in developing a better learnability as well as performing the tasks of cognition and memorizing in a better and improved way than he/she could with the traditional tutorial systems.

III. SELF-ADAPTIVE USER INTERFACE DESIGN

The tutorial based systems that have now become a need for the content providers to work on as from children to the elders, everyone now searches for the knowledge and explores e-learning portals or tutorial based systems/software. In our traditional e-learning environments, general satisfaction metrics are considered only. These are designed by considering general factors of design. Certain good designs may appear appealing and attractive to the youngsters but they may seem irritating to the elder people. People who belong to different age groups may prefer different sorts of designs and learning environments. An irritating layout may decrease the learner's learning rate and hence spoil his mood. Mood and emotions matter a lot in learning as they contribute towards memorizing and recalling; shapes and colors of the design matter equally.

Moreover, the cultural gap between a user and a web based system or any software is also a big reason resulting inconvenience and poor learning rate. The tutorial that serve the learning purpose are generalized or belong to the choice of either average people from only those who participate in any survey not for all hence make the rest suffer, i.e. the present tutorial systems have no way to choose or adapt the design as per one's personality aesthetics.

Our Proposed system is based on the idea to combine most of the ways used in previous studies along with the adaption of one's personal aesthetics for every individual user. Adaption is the main technique that would be used to solve the problem discussed earlier and as described in previous sections. User model is used for implementing adaption. The user model is a demonstration of information about any user that is crucial to be fed to the adaptive system as the user's profile. This proposed solution employs two layers that we named as *Memory Layer* and *Dynamic Layer* respectively while an additional component is an *Interface Repository*.

A) *Memory Layer*

Firstly, the "Memory layer" would store the user's profile and preferences as user's model. To implement this, it is needed that we create and maintain an *Interface Repository* containing multiple designs (see details in section C). After entering the system, user would be asked to sign up where the profile creation would demand a few questions about the user's interest, age group, likes, dislikes, earning, religion, color tone choices, profession, and physical weaknesses. All these are going to be the parameters or inputs to the rules that would form the dynamic layer. The answers of the questions fed to system would make the user's profile that is meant to be maintained. Note that all such questions would be asked only once, and would only be asked again by the system if user

wishes to change his preferences. System would save them in his profile details. So once created, the profile will only be updated by the user him/herself if he wants any change in the designs. Later on, the users' type and preferences would form that user's model. The user model of every individual would single him/her out to make his/her distinct choices applied on the display he/she gets. This model would then be used in second tier.

B) Dynamic Layer

Second one would be the system's "Dynamic layer" to load one of the multiple interfaces from the repository as per user model based on the answers that users gave as described in previous section. Implementing this layer would require to build some set of rules using the questions or the discriminating factors included in profile creation in first layer. As described earlier, these rules would take those answers as input and would combine all of them to judge whether this person want a soft monotonic interface or a fully animated one. So, this part of the system would dynamically decide that which of the interface from the pre-built multiple interfaces, is relevant to the user's pre-built profile or queries. And so, this approach would let every user have an interface that suits his very own personality aesthetics.

C) Interface Repository

This part is a very important and whole structure to answer how the personal aesthetics would be applied on the design built. For this it is needed to build multiple designs based on previous researches, rankings, and surveys conducted on more than one groups of people. For example, the repository may contain one design based on older age people, one based on the middle-class community choices, a few based on different cultures and so on. The suggested design preferences of previous studies' and surveys' can have many types of interfaces based on different age groups, cultures, genders, regions, and interests. Various professions, trends and religions also have impact on the choices and thinking style. The repository would contain various designs generated while considering these factors. This repository needs to be maintained and kept updated with the changing trends to make the possibility of having a personalized interface more close to being accurate.

In this proposed solution, for the first time when user would enter to the system, he/she would use a manual approach of providing his details of preferences. After that the system would automatically load the interface as per the requirements. If at some state, user wants the theme to be changed, an option would be provided to the user to edit the questions previously asked. The Dynamic layer of the system would then choose a new interface as per his/her new model. Different conditions would be executed with the change of details so that the user always gets a preferred design for him/her. Using such adaptive approach for tutorial based systems based on personal aesthetics would decrease the disturbance and frustration rate by a preferred design.

The main task would be first to conduct a survey and create multiple interfaces. The survey should be based upon all or

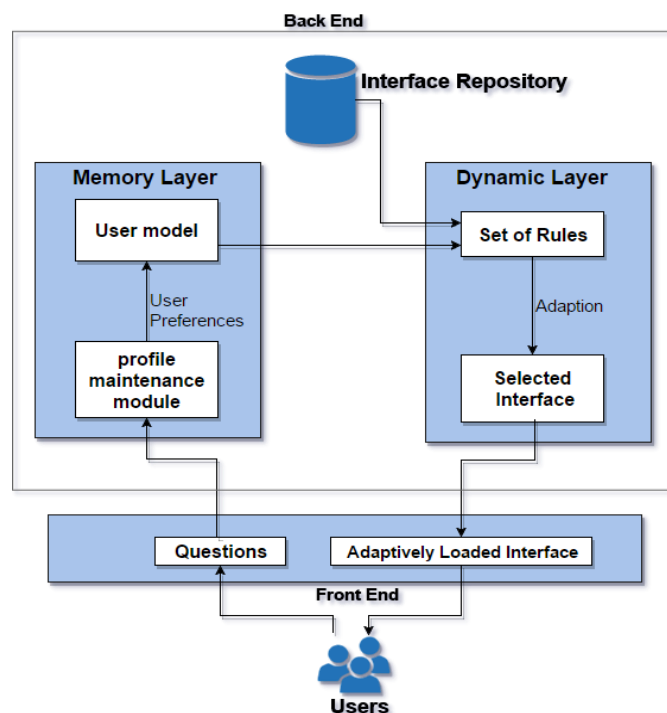


Fig. 1. Framework for Self Adaptive Interface Design System

most of the past ways used like age groups, culture, class, religion, and interests etc. After that the rest of the decision taking modules would be implemented. The system would mainly need: *one module for creating profiles, one for login, and one for editing the profiles*, if needed that would indirectly invoke the first module, then finally it would need a unit for loading the interfaces.

The design of a tutorial's interface has basic work in determining the type of interface. Whether to choose a well sophisticated theme or to go for a highly animated one; whether to opt from some visual demonstration or to highlight them; and whether to design for children, youngsters or for aged scholars. Different approaches are used by people to judge the type of interfaces, like surveys, Questionnaires, beta versions, prototype analyzing etc. though all those methods help yet they serve to a single group of people for a single interface, while our study has combined them all to be fed for adaption.

This study would help designers design interfaces by considering the users' aesthetic sense as requirements for their systems. Considering choice of every individual would help designers being more creative and would make the learners to get benefit from personalization and customization of the learning platforms. The application of such a strategy would help learners learn easily, memorize, and recognize the material as well as the illustrations more rapidly with an enhanced learning rate.

IV. CONCLUSION

So, our study concludes that in this era of online education trending at its peak, there is a big need to design systems that improve cognition, positive emotion generation and above all

memorizing and learning ability of people through their appearance and interface. The need is not only to improve the current designs of such systems, but instead of that it is an unseen requirement of the Internet community to upgrade the learning based software to self-adaptive software as per the user model of any certain user so that he/ she could have the design as per his/her own need hence avoiding the inconvenience and psychological as well as learning issues. To say Good bye to the irritating UI designs to improve UX and to wipe out the learning or focusing issues this study has proposed a solution to the UI Designers.

Our research has focused on highlighting the need of a system that, to some extent, collaborates different designs made through previously used approaches and uses adaption of one's choices in the design presented to him/her. Adaption is suggested for this purpose to be implemented by User model which is discussed in a later section of this study.

V. FUTURE WORK AND RECOMMENDATION

The future work in this context can be, implementing the user model with two layers proposed and explained earlier in this paper, also the Frequent change in a person's aesthetics or preferences may need the dynamic layer to work intelligently to change the UI as per users changing preferences by managing his preferences profile and learning the way he changes his preferences. So, the future researchers are directed to study and modify adaptive nature as being intelligent as per the frequent changes of user's preferences over any certain time specified.

Another direction can be that if there are certain users of same type, then a change of theme by one user can make system intelligently decide about when to suggest the same type of users about the similar change. Moreover, the system can also ask the people from same geographical location to take the prebuilt preferences of any already registered user.

Such profile maintenance and intelligent personality targeted UI design can also be a future aspect which is not discussed in this paper. The Profile maintenance can be further decomposed with the decomposition of different modules of the system where user gets the facility to change the design of only a specific page or service (customization) provided by the system as per his/her preferences. The UI can also be customized based upon the courses or domain chosen for study to help an Arts student get a design relevant to

his/her subject and an engineer to get his/her learning material in the design that an engineering related reading material should be in.

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